8-1.9 Geology

Scope of the 1995 Analysis

The 1995 EIS geology analysis is contained in sections 4.6 and 5.6 and was based on three issues: seismic hazards, volcanic hazards, and gravel use. The primary document for the seismic hazard analysis was based on the draft Woodward-Clyde Federal Services 1993 probabilistic seismic hazard assessment (PSHA). The volcanic hazards were analyzed by the Volcanic Hazards Working Group (VWG, 1990). The details of the 1995 EIS seismic and volcanic hazards characterization are discussed or referenced in Appendix F-2 of the 1995 EIS. Geologic (seismic and volcanic in this case) hazards and gravel use were not significant criteria in the alternative selection process and Record of Decision.

The 1995 EIS acknowledged that additional site specific analysis would be needed to ensure that structures modified or built as a result of decisions based on this EIS would be designed according to DOE and INEEL architectural and engineering (A&E) standards.

Changes in the Environmental Discipline

1. Methodology

The 1995 EIS concluded that geologic hazards and gravel use impacts were not a discriminating factor in the analysis of alternatives or the Record of Decision. The geologic hazards assessments used to support site characterization are cited and referenced in Appendix F-2 of the 1995 EIS. A final version of the draft INEEL PSHA used in the 1995 EIS has been incorporated into the INEEL A&E standards. These standards provide seismic design accelerations for structures built on rock for seismic events with return periods of 2,500 and 10,000 years. High hazard facilities (such as the Advanced Test Reactor) are designed to survive a seismic event with a 10,000-year return period. Soil response curves (which incorporate site specific soil amplification effects) have been prepared for certain areas of the INTEC.

The methodology used in producing the PSHA and volcanic hazards assessment is prescribed in the DOE standards and included extensive peer of intermediate and final products. This work has been reviewed by the Defense Nuclear Facility Safety Board, the Nuclear Regulatory Commission, and the State of Idaho as well as highly regarded experts in the seismological community.

2. Assumptions

Assumptions regarding the key parameters in the PSHA analysis (source, path, and site characteristics) have undergone extensive review and seem to be robust. The INEEL recently applied for and obtained a Nuclear Regulatory Commission license for the Three Mile Island Unit 2 Independent Spent Fuel Storage Installation (TMI ISFSI). In the course of obtaining this license, assumptions regarding site effects (soil amplification) and local path effects (attenuation of seismic waves by alternating layers of basalts and sedimentary interbeds) were further reviewed and validated. Source magnitude, location, frequency, and flow geometry assumptions underlying INEEL Volcanic hazards analyses have undergone similar reviews.

3. Analytical methods

The PSHA methodology as used at the INEEL involved the probabilistic characterization of seismic source location, magnitude, and frequency (return period). This characterization is formulated using seismic records, paleoseismological field data, and the statistical representation of source location and magnitude, site, and path effects. Three main types of seismic sources were accounted for including; a Basin and Range type earthquake (Borah Peak), a volcanic eruption, and a randomly occurring (in space and time) Snake River Plain earthquake. Volcanic hazards were also analyzed in a probabilistic framework.

4. Data adequacy

The geologic data and analyses presented in the 1995 EIS are adequate for site characterization and impacts analysis purposes. The INEEL A & E standards provide seismic design criteria for facilities built on rock and portions of INTEC underlain by soil. Subsequent design work will require site-specific analyses for soil response effects and soil structure interaction. Soil amplification effects can be severe and should be taken into account when the cost of construction is evaluated for any new construction projects.

5. Accident Scenarios

Accident analyses using seismic and volcanic events as initiators are listed in Table F-5-5 in the 1995 EIS. All seismic initiators have the same beyond design basis (10E-6) probability.

6. Accident Probability

Seismic and volcanic initiating event probabilities are listed in Table F-5-5 in the 1995 EIS. The final INEEL PSHA indicates that these events are still beyond design basis.

7. Cumulative Impacts

There are no cumulative impacts from seismic and volcanic hazards.

8. Changes in Regulatory Environment

The NRC concurred with DOE–ID's recommendation to design the TMI – ISFSI according DOE risk based criteria as opposed to NRC maximum credible earthquake criteria. This has broad implication for the rational determination of seismic risk in DOE Safety Analysis Reports (SARs), which are based on NRC type characterization requirements. DOE 5480.28 (Natural Phenomena Hazard Mitigation (NPH)) that was in effect at the time of 1995 EIS has been replaced by 420.1 (Facility Safety). The standards supporting DOE NPH characterization standards have been revised, updated, and finalized. All 1995 EIS and subsequent seismic and volcanic hazards characterization work has been performed consistent with these standards.

9. Other NEPA Analysis for INEEL Operations

The 1995 EIS accurately described the impacts of gravel use with respect to the alternatives. A subsequent environmental assessment was prepared to analyze the impacts of excavation and use of silt and clay at the INEEL.

There are no major geologic risks and impacts identified in the 1995 EIS. Subsequent revisions, finalizations and challenges to volcanic and seismic hazards characterization documents and their conclusions indicate that the initial assessments of these hazards in the 1995 EIS are bounding and adequate.

Extensive external review has shown that assumptions regarding the key parameters in the PSHA analysis which forms the basis of the INEEL A & E standards (source, path, and site) characteristics are robust. INEEL Volcanic hazards analyses have undergone similar reviews.

The 1995 EIS acknowledged that additional site specific analysis would be needed to ensure that structures modified or built would be designed according to DOE and INEEL architectural and engineering (A&E) standards. Design work for facilities located on significant soil thicknesses will require site-specific analyses for soil amplification and soil structure interaction. Soil amplification effects can be severe and should be taken into account when the cost of construction is evaluated during a site selection process.

The risk assessments associated with the characterization of seismic and volcanic hazards are rational and will support the reasonable allocation of resources.

Summary of Major Impacts

There are no major environmental impacts related to the 1995 EIS Geology characterization. Subsequent revisions, finalizations and challenges to volcanic and seismic hazards characterization documents and their conclusions indicate that the initial assessments of these hazards in the 1995 EIS are robust and bounding analyses.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

References:

1. Woodward-Clyde Federal Services, “Site-Specific Probabilistic Seismic Hazard Analysis for the Idaho National Engineering Laboratory – Final Report”, INEL-95/0536, dated May 1996

2. Volcanic Hazards Working Group, “Assessment of Potential Volcanic Hazards for New Production Reactor Site at the Idaho National Engineering Laboratory”, NPR91-029-DHC, dated 10/31/90

8-1.10 Health and Safety

Scope of 1995 Analysis

The 1995 Health and Safety analysis was completed for the proposed alternatives involving radioactive and non-radioactive hazards at the INEEL. This analysis is found in the 1995 EIS in sections 4.12 and 5.12. The analysis was conducted using consensus standards on health effects for exposure to ionizing radiation including International Council on Radiation Protection (ICRP) and National Council on Radiation Protection (NCRP) guidance.

Worker Risk Analysis - Radiological Hazards

The methodology used to calculate latent health effects to members of the public and the INEEL workforce is consistent with the National Council on Radiation Protection and Measurements guidance as well as other Federal Agencies. Personnel Dosimetry Data on monitored individuals at the INEEL indicate a decline in individual and collective radiation exposures. These exposures include both direct radiation and the effects of radiation from air emissions. The following table illustrates overall trends in radiation exposures.

Table 8-1.10.1 INEEL Personnel Exposure Trends[a]

Year	Number of People Monitored	Number of People with Measurable Dose	Total Effective Dose Equivalent (TEDE) (person-rem)	Average TEDE (mrem)
1991	7,402	1,273	177.1	139
1992	6,967	1,223	104.7	86
1993	7,322	1,424	252.9	178
1994	6,006	1,659	236.7	143
1995	5,984	1,501	284	189
1996	5,753	1,299	164.1	126
1997	6,424	1,141	115.3	101
1998	5,075	743	64.9	87
1999	8,885	729	48.3	66
2000	10,161	1440	64.8	45

a INEEL Radiological Dosimetry Program

The table clearly illustrates a sustained downward trend (TEDE) since 1995 in occupational radiation exposure. This is explained by an increased awareness in the planning of radiological work, monetary incentives to reduce occupational exposures, the adoption of the integrated safety management program and a decrease in work scope. It should also be noted that no DOE or INEEL Administrative Control Limits were exceeded during this period.

Table 5.12-5 shows that for Alternative B, the annual average radiation dose was estimated to be 219 person-rem per year. A review of the above table shows one year (1995) that exceeded this estimate. However, the average annual dose from the previous six years is 123.6 person-rem. This is well below the estimated average of 219 person-rem.

Changes in Regulatory Environment - DOE regulations 10 CFR 835 “Occupational Radiation Protection” and 10 CFR 830 “Quality Assurance,” and 10 CFR 850 “Chronic Beryllium Disease Prevention Program,” were issued. A final DOE regulation on Facility Safety Analysis and

Technical Safety Requirements will go into effect FY2001. The cumulative effect of these regulations is to improve the overall safety posture at DOE facilities.

Other NEPA Analysis for INEEL Operations – The Secretary of the Department of Energy directed several changes to Safety and Health Programs, including the Integrated Safety Management Program, and a revision to DOE Order 5400.5 to implement the Secretary's moratorium on the release of materials with residual contamination.

Worker Risk Analysis – Non-Radiological Hazards

The common non-radiological hazards encountered at the INEEL include work with chemical agents, Heat/Cold Stress, industrial hygiene considerations, and ergonomic considerations. Implementation of worker safety programs such as the Department's Integrated Safety Management program and the Voluntary Protection Program have improved the INEEL's safety posture. It is the conclusion of this review that the 1995 EIS continues to provide an appropriate bounding analysis of the non-radiological hazards at the INEEL.

1) Air Emissions

The health and safety impacts from Criteria Air Pollutants and Toxic Air Pollutants for most of the pollutants are clearly within the bounds established by the 1995 EIS. The following pollutants are those that were reported in the Air Resources section as having exceeded the estimated emissions in the 1995 EIS: beryllium, carbon tetrachloride, chloroform, hydrochloric acid, and VOCs.

VOCs as a group are measured for their potential to generate ozone and do not represent a direct hazard to workers. The hazards to workers from individual pollutants are addressed separately. Hazards from the VOC emissions are discussed under the Public Risk Analysis – Non-Radiological Hazards.

The potential health impacts of the rest of the pollutants addressed above are shown in the following table. In all cases, the concentrations of the air pollutants are below the given standards. Thus, while the emissions exceeded the previous analysis, the results show that there are no adverse health impacts from emissions at these levels.

Table 8-1.10.2 Onsite Emissions Impacts

Pollutant	1995 EIS Concentrations (μg/m^3)	Ratio[a]	Revised Concentrations (μg/m^3)	Standard (μg/m^3)[b]	Impact as percent of standard
Beryllium	2.8E-04	3.28	9.2E-04	2.0E+00	<1
Carbon tetrachloride	2.5E+02	9.21	2.3E+03	1.3E+04	18
Chloroform	1.7E+01	2.90	4.9E+01	9.8E+03	<1
Hydrochloric acid	1.4E+02	1.25	1.8E+02	7.0E+03	3

a This is the ratio of the 1999 Total INEEL Air Emissions Inventory Report to the 1995 EIS Air Emissions estimate from Table 8-1.3.2. This ratio when multiplied by the maximum concentrations in the 1995 EIS will provide the revised maximum concentrations of these pollutants.

b Limits are 8-hour time-weighted averages established by either the American Conference of Government Industrial Hygienists or the Occupational Safety and Health Administration; the lower of the two is used.

2) Injury/Illness Rate for 1996 – 2000

There were 1,092 reportable Injury/Illnesses from 1996 – 2000, during which a total of 61,085,712 hours were worked. Total injury/illness case rates varied from 2.9 to 4.2. By comparison, the 1995 EIS reported 1,337 reportable events from 1987 – 1991, during which a total of 79,654,000 hours were worked. The 1995 EIS reported total injury/illness case rates from 1.8 to 4.9. Comparing these two five-year periods show comparable case rates. However, the INEEL experienced two fatalities in 1996 and 1998. The 1996 fatality occurred when a worker fell from an elevated platform at the Radioactive Waste Management Complex. The 1998 fatality resulted from an unplanned discharge of a CO_2 fire suppression system at the Test Reactor Facility. A direct result of the two fatalities was the total revamp of the work control system to improve the integration of safety into all INEEL program activities. The 1995 EIS estimated an average injury/illness rate of 273 and an average fatality rate of 0.29 over the years from 1995 - 2005. Therefore, the 1995 EIS continues to bound the injury/illness rate for activities at the INEEL but the fatality rate is greater than that projected in the analysis. The major changes to the work control system described above are mitigative actions taken in response to the unacceptable fatality rate. A review of table 8-1.10.3 reflects the seriousness of the CO_2 accident in 1998 and gradual improvements since then.

Table 8-1.10.3 Injury/Illness Case Rates for the INEEL[a]

Year	Total Workhours	Total Recordable Cases		Lost Workday Cases		Fatalities
		Number	Rate[b]	Number	Rate[b]	
1996	12,711,062	197	3.1	80	1.3	1
1997	12,078,235	228	3.8	97	1.6	0
1998	11,530,387	244	4.2	94	1.6	1
1999	11,959,675	236	3.9	83	1.4	0
2000	12,806,353	187	2.9	76	1.2	0

a Data obtained from the DOE Computerized Accident/Incident Reporting System
b Case rates are determined by multiplying 200,000 hours (100 workers working for a year) by the number of cases divided by the number of workhours.

3) INEEL Fire Loss History

During the period 1994 – 2000, the INEEL has experienced approximately 40 Wildland fires. The INEEL successfully contained the wildland fires without damage to significant INEEL structures; the 2000 wild land fire destroyed several utility poles. In addition, the INEEL was commended by the Secretary of Energy for successfully containing a wildland fire in 2000. The fire safety posture for the INEEL is enhanced by cooperative agreements for support with the counties surrounding the INEEL as well as other federal agencies such as the Department of Interior. The 1995 EIS reported $88,000 in fire related damages in the five year period analyzed. The 1995 EIS continues to provide a bounding analysis for INEEL fire losses.

Public Risk Analysis - Radiological Hazards

1) Air Emissions

The public risk from ongoing operations is the risk associated with air emissions and associated inhalation and ingestion pathways. The following table shows the dose to a maximally exposed individual as estimated by the Environmental Science and Research Foundation, an independent environmental monitoring organization. This table shows that the dose to the public is well below the doses that were estimated in the 1995 EIS.

Table 8-1.10.4 Radioactive Dose to the Public

	Dose to Maximally Exposed Individual (mrem)	1995 EIS Estimated Dose to Maximally Exposed Individual (mrem)[e]	Maximum Potential Population Dose (person-rem)	1995 EIS Estimated Maximum Potential Population Dose (person-rem)[f]
1995[a]	0.018	0.63	0.08	2.9
1996[b]	0.03	0.63	0.2	2.9
1997[c]	0.03	0.63	0.2	2.9
1998[d]	0.007	0.63	0.08	2.9

a. Site Environmental Report for Calendar Year 1995, DOE/ID-12082 (95) (ESRF-014)
b. Site Environmental Report for Calendar Year 1996, DOE/ID-12082 (96) (ESRF-018)
c. Site Environmental Report for Calendar Year 1997, DOE/ID-12082 (97) (ESRF-030)
d. Site Environmental Report for Calendar Year 1998, DOE/ID-12082 (98) (ESRF-034)
e. 1995 EIS, Table 5.12-1, Alternative B – 10-year dose of 6.3 mrem divided by 10 to give an average yearly dose of 0.63 mrem.
f. 1995 EIS, Table 5.12-2, Alternative B – 10-year dose of 29 mrem divided by 10 to give an average yearly dose of 2.9 mrem.

One area where the 1995 EIS made an assumption regarding public exposure that was not conservative is the assertion that it is unlikely for hunters to eat game animals that feed on INEEL rangeland. Over the last several years, the Idaho Department of Fish and Game has held controlled hunts on the INEEL. Reference d from the above table provides a maximum potential dose to a hunter consuming game from the INEEL as 0.03 mrem. If this value is added to the dose for a maximum exposed individual for any of the years, the result is still well below the estimated maximum dose given in the 1995 EIS.

2) Ground Water Impacts

The 2000 RWMC Performance Assessment (PA) provided updated impacts to a maximally exposed member of the public from the low-level waste disposal facility located at the RWMC. The 2000 RWMC Composite Analysis shows the impacts to that same individual from all sources of buried radioactive wastes at the RWMC. The 1995 EIS used information from the 1994 RWMC PA. While the times of compliance that are shown in the following paragraph are not entirely consistent, these are the doses which are presented in each of these reference documents. Each of the doses presented are estimates of doses to a maximally exposed member of the public at the receptor locations.

In the near term (through the year 2120):

1995 EIS	0.57 mrem/yr
2000 RWMC PA	0.0022 mrem/yr
2000 RWMC CA	0.07 mrem/yr

In the long-term:

1995 EIS	17 mrem/yr	10,000 years
2000 RWMC PA	15.9 mrem/yr	10,000 years
2000 RWMC CA	30 mrem/yr	3,000 years

As shown in the ground water analysis, these results are not comprehensive for the site. While these preliminary results show no adverse impacts to the public, they are not complete. While the analysis provided in the 1995 EIS regarding ground water doses over the next 20 years is comparable to the 2000 RWMC CA for the wastes that were analyzed, it is not clear that health impacts are understood especially in the light of new D&D decisions that are made to potentially leave additional waste in the ground. While a great deal of additional work has been completed since the 1995 EIS, a cumulative analysis of the health impacts of all of the radioactive wastes that are left in the ground to a maximally exposed individual has not yet been completed. This analysis is necessary in order to make informed decisions regarding ongoing D&D, waste disposal, and environmental remediation activities.

Public Risk Analysis – Non-Radiological Hazards

The health and safety impacts from Criteria Air Pollutants and Toxic Air Pollutants for most of the pollutants are clearly within the bounds established by the 1995 EIS. The following pollutants are those that were reported in the Air Resources section as having exceeded the estimated emissions in the 1995 EIS: beryllium, carbon tetrachloride, chloroform, hydrochloric acid, and VOCs.

VOCs are measured for their potential to generate ozone. The State does not require evaluation of projected increases in ambient ozone concentrations under application procedures for major stationary sources unless a new or modified major facility will result in a net increase in VOCs of 100 tons per year or greater. Part of the reason for the lack of required analysis at lesser emission levels is because no simple, well-defined methods exist to evaluate ozone generation potential. The revised maximum VOCs emission level is well below the threshold emission level of 100 tons per year for which analyses are required by the State and the 4- ton per year threshold for designation as a major source. Therefore, ozone precursor emissions of VOCs are expected to be a negligible contributor to ozone generation and no further analyses have been conducted.

The potential health impacts of the rest of the pollutants addressed above are shown in the following table. The table uses a simple ratio of the 1995 EIS emission rates to the 1999 AEI emission rates and multiplies that ratio by the 1995 EIS concentrations to obtain the revised concentrations. This is an acceptable comparison method as long as the location of the releases in the AEI is the same distance from (or farther from) public roads.

Because beryllium emissions are from the consumption of fossil fuels and fossil fuels are consumed across the site, simply scaling the emissions is appropriate without taking into consideration specific locations. For carbon tetrachloride and chloroform, the location of the highest concentrations reported in the 1995 EIS are at the RWMC. Since this is also the location of the higher revised emissions, this is a reasonable method for comparison.

For hydrochloric acid, the location of the highest concentrations reported in the 1995 EIS are at the WERF (3.2 miles from public roads). Since the emissions of the higher concentrations are approximately ½ from WERF and ½ from the RWMC (2 miles from public roads) this will not give an accurate representation of the actual air concentrations. So information from reference 1 (where emissions were modeled at the RWMC) was used to show the maximum concentrations for HCl to the public.

In all cases, the revised concentrations of these air pollutants are below the given standards. Thus, while the emissions exceeded the previous analysis, the results show that there are no adverse health impacts from emissions at these levels.

Table 8-1.10.5 Offsite Emissions Impacts

Pollutant	**1995 EIS Concentrations (ng/m^3)**		**Ratio**[a]	**Revised Concentrations (ng/m^3)**		**Standard (ng/m^3)**[b]	**Impact as percent of standard**	
	Site Boundary	**Public Roads**		**Site Boundary**	**Public Roads**		**Site Boundary**	**Public Roads**
Beryllium	4.0E-04	1.0E-03	3.28	1.3E-03	3.3E-03	4.2E+00	<1	<1
Carbon tetrachloride	2.4E+00	2.2E+00	9.21	2.2E+01	2.0E+01	6.7E+01	33	30
Chloroform	8.9E-02	8.3E-02	2.90	2.6E-01	2.4E-01	4.3E+01	<1	<1
Hydrochloric acid[c]					1.7E-02 mg/m^3	3.8E-01[d] mg/m^3		4.5

a This is the ratio of the 1999 Total INEEL Air Emissions to the 1995 EIS Air Emissions estimate from Table 8-1.3.2. This ratio when multiplied by the maximum concentrations in the 1995 EIS will provide the revised maximum concentrations of these pollutants.

b As in the 1995 EIS, these are the Acceptable ambient concentration increments (AAC) listed in State of Idaho Rules for the Control of Air Pollution in Idaho. These standards apply to incremental (not cumulative) impacts of facilities constructed or modified after May 1, 1994.

c. The ratio was not used for this pollutant. The revised concentrations were obtained from "Operable Unit 7-08 Air Dispersion Modeling and Health Effects from Thermal and Catalytic Oxidation Unit Emissions at the Radioactive Waste Management Complex", EDF-1901, June 25, 2001. Only the portion of the HCl emissions that is greater than in the 1995 EIS are reflected here. Since the locations of the two sources are different, there is not a concern with cumulative effects between the two sources.

d. Acceptable Ambient Concentration (AAC) for hydrochloric acid (24-hour average) (IDAPA 58.01.01)

Summary of Major Impacts

The INEEL conditions, data, and methodology used in the 1995 EIS remain valid with the exception of the five air pollutants discussed below. The type and scope of work performed at the INEEL has not changed significantly during the period 1995 – 2000. Changes in the safety programs at the INEEL have improved operational safety in many respects. Adoption of the

Radiation Protection, Quality Assurance, and Nuclear Safety Regulations has improved the overall conduct of operations and safety at the INEEL. Implementation of the Integrated Safety Management System at the INEEL ensures that operations performed at the INEEL have safety and health requirements integrated with all INEEL work activities.

While emissions of hazardous air pollutants were greater than estimated for five pollutants, the resulting maximum concentrations for those pollutants are still below any regulatory threshold requiring additional controls. As a result there are no adverse health impacts to the public from these pollutants.

The analysis for the RWMC shows no adverse health impacts to the public from buried wastes. However, a cumulative analysis of all of the sources of radioactive wastes left in the ground at the INEEL over the long term needs to be performed in order to fully understand the potential ground water related health impacts to the public.

The analysis in the 1995 EIS was adequate for DOE decisions announced in the ROD. Future DOE decisions on major federal actions on the INEEL, or decisions deferred in the ROD, will require additional analysis for this discipline.

References:

1. INEEL Radiological Dosimetry Program

2. Air Emissions Inventory for the Idaho National Engineering and Environmental Laboratory – 1999 Emission Report, DOE/ID-10788, May 2000

3. DOE Computerized Accident/Incident Reporting System

4. Site Environmental Report for Calendar Year 1995, DOE/ID-12082 (95) (ESRF-014)

5. Site Environmental Report for Calendar Year 1996, DOE/ID-12082 (96) (ESRF-018)

6. Site Environmental Report for Calendar Year 1997, DOE/ID-12082 (97) (ESRF-030)

7. Site Environmental Report for Calendar Year 1998, DOE/ID-12082 (98) (ESRF-034)

8. Technical Revision of the Radioactive Waste Management Complex Low-Level Waste Radiological Performance Assessment for Calendar Year 2000, INEEL/EXT-2000-01089, September 2000

9. Radioactive Waste Management Complex Low-Level Waste Radiological Composite Analysis, INEEL/EXT-97-01113, September 2000

10. Operable Unit 7-08 Air Dispersion Modeling and Health Effects from Thermal and Catalytic Oxidation Unit Emissions at the Radioactive Waste Management Complex, EDF-1901, June 25, 2001

8-1.11 INEEL Services

Scope of the 1995 Analysis

The 1995 EIS addressed INEEL Services in the areas of water consumption, electricity consumption, fuel consumption, wastewater disposal, and security and emergency protection. These are discussed in sections 4-13 for the baseline services and section 5-13 for the alternatives analysis. Calendar year 2000 represents the most recent full operating year. This is a representative year for utilities. The 1995 EIS Annual Usage column reflects the baseline utilities plus the anticipated additions from implementing Alternative B. Changes in these services are reflected in the following table.

Table 8-1.11.1 Usage of Resources

1995 EIS Annual Usage	Most Recent Data	Change in Usage
Water usage – - INEEL site: 1.78 billion gallons - I.F. Facilities: 79 million gallons	Water Usage 2000 - INEEL site: 1.2 billion gallons, I.F. Facilities: 71 million gallons	Decreased water usage.
Electricity usage - INEEL site: 303,521 megawatt hrs I.F. Facilities: 31,500 megawatt hrs	Electricity usage 2000 - INEEL site: 156,639 megawatt hrs I.F. Facilities: 27,683 megawatt hrs	Decreased electricity usage.
Fuel consumption - Heating Oil usage - 4.25M gal; Diesel Fuel usage - 1.8M gal; Propane gas use - 863,000 gal; Gasoline usage - 557,000 gal; Jet Fuel usage - 73,100 gal; Kerosene usage - 33,800 gal; Coal usage - 9000 tons (Natural gas and LNG/CNG was not addressed in the 1995 EIS)	Calendar Year 2000 Actuals Heating Oil use - 2.3 M gal Diesel Fuel use – 652,800 gal Propane usage - 63,121 gal Gasoline usage - 381,347 gal Jet Fuel usage - 0 gal Kerosene usage - 45,006 gal Coal usage - 0 tons LNG/CNG usage 4.6Mbtu (vehicles and two buildings at CFA) Natural Gas usage – (I.F. facilities) - 16,816 Mcf	Heating Oil - Decrease; Diesel Fuel - Decrease; Propane - Decrease; Gasoline - Decrease; Jet Fuel - Decrease; Kerosene - Increase;[1] Coal – Decrease[2] Note: 1 - Kerosene increase was due to NWCF operations at INTEC. This process is temporarily shutdown. 2 - The Coal Fired Steam Generating Facility at INTEC was permanently shut down in late FY-99. A separate NEPA review was completed.
Wastewater treatment and discharge systems. Average annual wastewater disposal - INEEL site: - 144 million gallons I.F. facilities: 79 million gallons	Wastewater disposal 2000 - INEEL site: 1.16 billion gallons I.F. facilities: 70 million gallons	INEEL site - Decrease;[3] I.F. facilities - Decrease 3 - The data for the INEEL site for 1995 (142 million gallon) appears to be in error. Based on 1996 data, (1.18 billion gallon disposed), an overall decrease is evident. This water disposal is in

		accordance with regulatory requirements and no adverse environmental impacts have been observed as a result of this disposal.
Fire Department - The INEEL contractors operate and staff three fire stations on the site. Each station has a minimum of one engine company capable of supporting any fire emergency in their assigned area. The services also include site ambulance, emergency medical technician, and hazardous material response services. Mutual aid agreements exist with fire fighting entities such as the BLM and cities of Idaho Falls, Blackfoot, and Arco.	The Fire Department is basically the same as the 1995 description. Several infrastructure improvements to the Fire Department have taken place as follows: Replacement of the CFA and ANL-W fire stations, a new fire fighting training facility, upgrade of several fire fighting trucks and the addition of a wildland fire suppression unit.	Replacement fire stations at CFA and ANL-W were completed in October 1996 and November 1998 respectively. Also, at CFA, a Fire Training Facility was constructed complete in July 1997, and the old fire fighter training facility was torn down. Another change was the addition of one heavy wildland fire suppression unit.
Emergency Preparedness - Each INEEL contractor administers and staffs its own emergency preparedness program under supervision of DOE. The DOE emergency preparedness system includes mutual aid agreements with all regional county and major city fire departments, police, and medical facilities.	The Emergency Preparedness programs for DOE-ID and the Contractors are essentially the same as the 1995 program description. The Warning Communications Center has been enhanced to improve communication. Mutual aid agreements with regional county and major city fire departments, police, and medical facilities remain essentially unchanged from 1995.	No change - Improvement to the Warning Communications Center was performed.
Security - DOE has oversight responsibility for safeguards and security at the INEEL. The security program is divided into three categories: security operations, personnel security, and safeguards.	The Security Program for DOE-ID and the Contractors is essentially the same as the 1995 program description. There are memorandums of agreements with city, county, and state law enforcement support.	Changes are: 1) Elimination of two helicopters stationed at the INEEL. 2) Acquisition of one M1114 up-armored special purpose military vehicle. 3) Constructed a new central alarm station at INTEC which receives all INEEL alarms. 4) Constructed a replacement security entrance building for INTEC which includes improved security offices and portal monitoring. 5) Upgraded the security firing range at ANL-W.

Summary of Major Impacts

In almost every category, the usage rate for these resources has gone down. Where they have not, the increase has been more than offset by the identified decreases in resource usage.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

References:

1. Ogilvie, C. to Harker, W. S., E-mail, "EIS Supplemental Analysis – Administrative Record for Emergency Preparedness", dated 5/28/2001

2. INEEL Nonradiological Waste Management Information System, "INEEL Water Usage Summary in Thousand Liters Record to Date", INRPT 032A, dated 3/21/2001

3. INEEL Nonradiological Waste Management Information System, "INEEL Water Pumped Summary in Thousand Liters Record to Date", INRPT 032, dated 3/21/2001

4. Guymon, R. H. to Dunn, D., letter, "Transmittal of the 2000 INEEL Water Use Report", CCN 18562, dated 2/26/2001.

5. INEEL, Quarterly Energy Conservation Performance Report, dated 3/3/2000

6. INEEL, "Infrastructure Long-Range Plan", INEEL/EXT-2000-01052, August 2000

7. Harker, W. S., "Worksheet showing additions due to alternative B (Ten-Year Plan) Volume 2 Part A page 5.13.3", dated 5/11/01

8. INEEL, "INEEL Industrial Usage Summary (Fuel Oil & Diesel, Coal and Water Pumped)", INRPT 030A

8-1.12 Irreversible and Irretrievable Commitments of Resources

Scope of 1995 EIS

The 1995 EIS analyses found irreversible and irretrievable commitments would potentially include land, groundwater, aggregate, and energy resources in section 5.18. These resource commitments would be caused by past activities, construction, and operation of new storage and disposal facilities and potential remediation actions.

Changes in the environmental discipline

The methodology used in the 1995 EIS was to review each alternative and the project specific impacts for commitment of resources that could be considered to be irreversible or irretrievable. The major assumption used was that impacts on air quality are not considered irreversible and irretrievable commitments of resources. Rather, these are potential impacts that could materialize and persist for the duration of the projects in question. This methodology and the major assumptions are still applicable.

Summary of Major impacts

Of the projects analyzed in the1995 EIS some are no longer operating, and of the planned projects, some have not been implemented. As a result irreversible and irretrievable commitments of resources have in general been less than projected in the1995 EIS.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

8-1.13 Land Use

Scope of 1995 Analysis

Section 4.2 of Volume 2 Part A of the 1995 EIS described the existing land uses on the INEEL and in the surrounding areas and land use plans and policies applicable to the surrounding area. Section 5.2 of Volume 2 Part A of the 1995 EIS provided an analysis of the impacts to INEEL lands and the area surrounding the site from existing and proposed activities. DOE compared proposed land uses and plans to existing land uses and plans. Potential effects, if any, of changing land uses were qualitatively assessed. For the purposes of assessing land use impacts, it was assumed that no projects would be built outside the INEEL boundaries, DOE determined there would be no effects on the public and private land use that surround the site.

For the selected alternative (the preferred alternative), DOE determined the proposed activities would be consistent with existing DOE plans for continued operations, environmental restoration, and waste management and would be similar to uses in existing developed areas on the site.

Ultimate shutdown and decontamination and decommissioning (life cycle) impacts for the projects were qualitatively assessed if they occurred beyond the time fame (10 years) analyzed in the 1995 EIS. The 1995 EIS does not specifically indicate the time frame used for the analysis of land use impacts, however, land use impacts were assumed to occur for the duration of the activity. For some activities, the loss of acres of open space was considered to be an irretrievable and irreversible commitment of resources (radioactive waste disposal).

Changes in the Environmental Discipline

1. Methodology-No change

2. Assumptions-No change

3. Analytical Methods-NA

4. Data Adequacy- N/A

5. Accident Scenarios-N/A

6. Accident Probabilities-N/A

7. Cumulative Impacts

   The EIS predicted that INEEL activities would disturb approximately 537 acres. The total acres now disturbed or predicted to be disturbed is 705. (See following discussion of land use.)

8. Changes in Regulatory Requirements-N/A

9. Other NEPA Analysis for INEEL Operations

Additional NEPA analyses for land use concerns have been completed in the Advanced Mixed Waste Treatment Project EIS; Treatment and Management of Sodium-Bonded Spent Nuclear Fuel EIS; the Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, including the Role of the Fast Flux Test Facility; and the High-Level Waste and Facilities Disposition EIS.

A qualitative analysis of INEEL activities was performed to determine if current land uses are different from those described in the 1995 EIS. Some changes have occurred in the activities described in the 1995 EIS. The most important changes include:

- Two new percolation ponds for process water from INTEC are being constructed approximately two miles from INTEC. The new ponds were not contemplated during the development of the 1995 EIS. The ponds will cover approximately twenty acres. This activity was included in the ROD for WAG 3,

- The INEEL CERCLA Disposal Facility (ICDF) is a CERCLA – authorized, RCRA/TSCA – compliant mixed-waste disposal facility for the on-site disposal of INEEL CERCLA soils and debris. The design of the ICDF will meet the minimum technology requirements for a RCRA Subtitle C landfill, with a low permeability layer and a double liner leachate collection system. The leachate collection system will feed to a lined hazardous waste evaporation pond with an estimated surface area of approximately five acres. The waste disposal landfill will cover approximately 23 acres and is sized to accept approximately 510,000 cubic yards of waste. The total land disturbed by building the facility will be approximately 40 acres. The planned location of the ICDF is outside the facility fence immediately south of INTEC and west of the existing percolation ponds.

- The Staging, Storage, Stabilization, and Treatment facility (SSSTS) will be a general purpose support facility designed to provide centralized receiving, inspection, and treatment of wastes from various INEEL CERCLA remediation sites prior to disposal into the ICDF or shipment offsite. The facility will encompass approximately 50,000 square feet, and consist of a storage/staging building and associated treatment equipment, a waste storage area, decontamination facilities, and an office facility. The total land disturbed by building the facility will be approximately 20 acres. This facility will be located outside the INTEC fence along the southwest side.

Several projects listed in the 1995 EIS will not be built including the Waste Characterization Facility, the Mixed Waste Disposal Facility, and the Idaho Waste Processing Facility. One project, the Advanced Mixed Waste Treatment Facility, was built within the Radioactive Waste Management Complex and not outside that facility's fence as described in the1995 EIS (Volume 2 Part B, Figure C-1-1). Another project, the Dry Fuel Storage Facility, will not be built inside the INTEC fence, but will be built just east of the INTEC fence on a previously disturbed (FPR soil storage and laydown area) site.

In addition, several other facilities not identified in the 1995 EIS have been constructed on the INEEL including the ANL-West Fire Station, the CFA Fire and Medical Facilities, and new sewage lagoons located adjacent to the Test Reactor Area's east fence.

A portion of the INEEL was set aside as a Sagebrush Steppe Reserve in order to preserve that unique ecosystem. This is a change in land management policies and practices but does not change the overall land use. The Sagebrush Steppe Reserve is still maintained as part of the withdrawn land used as a buffer zone around active facilities.

Since the 1995 EIS was completed, DOE has developed two additional planning documents, the Comprehensive Facility and Land Use Plan and the Draft Infrastructure Long Range Plan. The Comprehensive Facility and Land Use Plan provides a comprehensive resource of facility and land use planning information for the INEEL to guide land and facility use decisions. The plan represents DOE facility and land use policy and serves as a reference for INEEL personnel and the public. The Draft Infrastructure Long Range Plan provides a forecast of the INEEL infrastructure – the basic land, facilities and capital equipment needed for the INEEL to function.

On November 9, 2000, President Clinton signed a Presidential Proclamation that expanded the boundaries of Craters of the Moon National Monument. The expansion adds 661,000 acres to the existing 54,000-acre monument.

The previously noted changes in activities at the INEEL do not differ substantially from planned uses of the INEEL.

Acres of undisturbed land projected to be disturbed: 537 acres (217 hectares)
Approximate acres of undisturbed land actually disturbed including acreage to be disturbed that was identified in a decision document but not yet implemented:

INTEC Percolation Ponds	= 20
ICDF	= 40
SSST	= 20
Expanded Landfill	= 225
CFA Medical and Fire Station	= 7
Gravel Pits Total	= 85
*Silt/Clay Sources	= 290
TRA Sewage Lagoons	= 18
Total	= 705

*An Environmental Assessment for New Silt/Clay Source Development and Use at the INEEL was completed and identified 290 additional acres needed for Silt/Clay extraction.

Summary of Major Impacts

A number of changes in activities at the INEEL were noted, however they do not differ substantially from planned uses. There have been changes in land management policies and practices but this has not changed the overall land use.

The 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

References:

1. INEEL Comprehensive Facility & Land Use Plan, DOE/ID-10514, December 1996

2. Draft Infrastructure Long Range Plan, February 15, 2001

3. Environmental Assessment for New Silt/Clay Source Development and Use at the INEEL, DOE/EA-1083, May 1997

8-1.14 Mitigation

Potential mitigation measures were discussed in Section 5.19 of Volume 2, Part A of the 1995 EIS. That analysis was applied to the Cultural Resources, Aesthetic and Scenic Resources, Geology, Air Resources, Water Resources, Ecology, Transportation, Health and Safety, INEEL Services, Facility Accidents analyses. The discussion of mitigation measures in the 1995 EIS did not distinguish mitigation from standard practices and appeared to treat all activities that reduce any impact as mitigation. Mitigation measures were discussed in general terms and the document seemed to imply that mitigation activities would be addressed for each new activity as more was known about that activity (e.g., the Advanced Mixed Waste Treatment Facility).

It is acknowledged that normal programmatic activities will continue and any impacts will be minimized to the extent possible using standard practices. However, without a clear distinction between standard practices and specific mitigation activities for a specific action, it is not clear what mitigation measures may have been required for a given activity. Therefore, the document did not stipulate any specific mitigation measures and relied on standard, routine practices to reduce or eliminate the impacts of any alternative selected. No Mitigation Action Plan was prepared in conjunction with the EIS or Record of Decision and the ROD did not commit to any particular mitigation. However, the 1995 EIS did not include all site wide activities (e.g., reactor and in-town operations).

Typically, mitigation is addressed as the following. Mitigation is a specific activity associated with a specific alternative that will lessen specific adverse impacts of that alternative. Mitigation can be accomplished by:

a) Avoiding the impact altogether by not taking a certain action or parts of an action.
b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
e) Compensating for the impact by replacing or providing substitute resources or environments.

Generally, mitigation activities are appropriate when an alternative will have significant effects on the environment if implemented. The impacts of implementing mitigation activities must be evaluated in the NEPA document.

Summary of Major Impacts

The Mitigation analysis is adequate for the scope of activities identified in the 1995 EIS. The addition of other actions to this scope will require additional review to ensure Mitigation actions are not required.

The 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

8-1.15 Noise

Scope of the 1995 Analysis

Section 4.10 of Volume 2 Part A of the 1995 EIS described the INEEL-related noise of public significance occurring during 1995. That section also provided noise levels from other sources not related to INEEL activities to help the public put noise levels into perspective. Section 5.10 of Volume 2 Part A of the 1995 EIS analyzed the effects of INEEL-related noise of public significance stemming from buses, trucks, private vehicles, helicopters, freight trains, air cargo and business travel, industrial operations, and construction activities for all the alternatives. The methodology used in the 1995 EIS was to describe how far facilities were from public receptors; thus justifying that the only impact to the general public was from transportation noise. Transportation of the operations workforce stationed at the site to and from the site and waste and spent fuel shipments were considered to be the largest contributors to noise impacts to the public. Noise impacts to workers were considered to be “mitigated” by OSHA requirements. The operations workforce stationed at the site (i.e., transportation impacts) was assumed to be lower than the baseline for all years for all alternatives. Therefore, there would not be an increase of noise impacts over the baseline from the operations workforce traveling to and from the site. Waste and spent fuel shipments were determined to be infrequent and indistinguishable from any other public transportation noises. Noise impacts from railroad and aircraft traffic were determined to be negligible. No environmental impact due to noise was expected from any of the alternatives.

Changes in the Environmental Discipline

1. Methodology-No change

2. Assumptions-No change

3. Analytical Methods-NA

4. Data Adequacy- N/A

5. Accident Scenarios-N/A

6. Accident Probabilities-N/A

7. Cumulative Impacts-N/A

8. Changes in Regulatory Requirements-N/A

9. Other NEPA Analysis for INEEL Operations

Additional NEPA analyses for noise concerns have been completed in the Advanced Mixed Waste Treatment Project EIS; Treatment and Management of Sodium-Bonded Spent Nuclear Fuel EIS; the Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, including the Role of the Fast Flux Test Facility; and the High-Level Waste and Facilities Disposition EIS.

A qualitative analysis was completed by comparing the numbers and types of sources of transportation noises identified in the 1995 EIS to current sources. A re-evaluation of noise impacts is not warranted based on the following:

- The total number of INEEL workers was approximately 8,600 in 1995 (1995 EIS) and the current number is approximately 8,155 (INEEL Impact 2000). However, the number of site workers has remained fairly constant for the past several years. The 1995 EIS used 4,000 to 5000 site workers and the current estimate in the HLW EIS is also 4,000 to 5,000 workers.
- The INEEL no longer has helicopters eliminating those impacts,
- Major projects not identified in the 1995 EIS would have a negligible increase in transportation noise that could affect the general public,
- There is now a consolidated bus route which reduces the number of buses and routes used from 133 buses for 108 routes in 1995 to 104 buses for 81 routes in 2000,
- There is also only a four day work week now for site workers instead of a five day work week which reduces transportation noise,
- Several projects listed in the 1995 EIS will not be built including the Waste Characterization Facility, the Mixed Waste Disposal Facility, and the Idaho Waste Processing Facility, and
- Shipments of transuranic waste, low-level waste, and spent nuclear fuel have been much lower so far than predicted in the 1995 EIS.

Summary of Major Impacts

The primary source of noise from INEEL operations is from transportation noise. There have been a number of decreases in transportation activities in the last five years including total number of INEEL workers, decrease in the number of bus routes, elimination of helicopters, and use of a four day work week.

The 1995 EIS provides a bounding analysis for the environmental impacts of noise. Additional analysis for this discipline is not required.

References:

1. INEEL Impact 2000

2. Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement, DOE/EIS-0287D

8-1.16 Regulatory Framework

Scope of 1995 EIS

The 1995 EISs Chapter 7 listed some, though not all, of the Federal laws applicable to the INEEL and provided a very summary description of the function of the law.

Changes in the environmental discipline

1. Methodology

This method of identifying and defining various federal laws met the minimal criteria set by CEQ for an EIS at that point in time. Nonetheless, it is not the best approach for satisfying the spirit of the CEQ regulation cited previously. Part 1502.25(b) requires that DOE consider the proposed activity(ies) and the applicable Federal laws, and harmonize how the legal requirements would be carried out if the proposed activity were selected for implementation.

2. Assumptions

a) All programs and activities at the INEEL comply with all Federal laws, both in ongoing activities and operations, and in future activities and operations, out to the planning horizon analyzed in this SA;

b) Because reliable National opinion polls show that environmental protection continues to be a primary concern for most Americans, regardless of political party, any shifts in Presidential or Congressional party make-up will not result in a dramatic change in Federal environmental law (either dramatically more protective of the environment or dramatically less protective of the environment) from the current law;

c) The regulatory entities that monitored Federal law compliance at the INEEL in 1995 remain essentially unchanged, and based upon "b" above, will continue in their roles out to the planning horizon of this SA (with the exception of some minor changes that are discussed in the subsequent section on "privatization");

d) Any budget-cutting activities by Congress will not eliminate funds essential to meeting the assumption in "a" above, at least out to the planning horizon analyzed in this SA.

3. Changes in Regulatory Requirements.

The purpose of this analysis is to review the 1995 EIS's Chapter 7, *"Consultations and Environmental Requirements,"* and compare the legal requirements described in that document against the present-day legal requirements that govern current and proposed activities at the INEEL. The purpose for making this comparison is to address a two-part issue: a) have the applicable environmental laws (statutes, regulations, rules, orders, and binding agreements] changed in any way over the past five years; b) if there have been changes, is there a reasonable possibility that the changes could cause significant impacts to the environment on and around the INEEL?

Appendix 8 – 3 provides a listing of all of the currently applicable regulations.

Summary of Major impacts

The analysis that was performed for the 1995 EIS was acceptable for the time in which it was performed. However, the approach taken was simply a recitation of the most applicable regulations and a general statement of the intent of the regulation. The analysis that needs to be completed is to provide a complete list of all applicable regulations with analysis of how those regulations will have impacts on human health and the environment. In every case reviewed, changes in regulations between 1995 and 2000 were to make the regulations more restrictive, thus reducing environmental impacts. The HLW & FD EIS provides a good analysis of most regulations applicable to the INEEL and provides the appropriate level of analysis. The 1995 EIS does not provide a bounding analysis for the regulatory environment, however, the HLW & FD EIS provides the majority of the required analysis. Because the regulatory changes have resulted in reduced environmental impacts, no further analysis is required.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

8-1.17 Relationship Between Short-term Use of the Environment and the Maintenance and Enhancement of Long-term Productivity

Scope of 1995 EIS

The 1995 EIS analyses found that there would be no long-term loss of productivity from the actions planned except for the impacts to the ecology. Ecological impacts would result in the loss of productivity and biodiversity associated with the amount of land that would be disturbed and used.

Changes in the environmental discipline

1. Methodology

The methodology used in the 1995 EIS was to review each alternative and the project specific impacts for potential impacts that would occur over the life of the project. These potential impacts were then compared to the potential benefits that may result over the long-term from the project. This same methodology was used for this SA.

2. Assumptions

The major assumption used was that each and every project would result in a potential long-term benefit.

3. Analytical Methods

None used. Analytical analyses were performed by each of the disciplines, alternative by alternative.

4. Data Adequacy

Determined by each discipline.

5. Accident Scenarios

Accident impacts are not included in this section. The potential impact from a single accident at a facility is included in the existing accident analysis section. The probability of multiple accidents at multiple facilities is so small that the situation is not analyzed.

6. Accident Probabilities - N/A

7. Cumulative impacts

Cumulative Impacts are addressed specifically in another section of the SA. In general, potential cumulative impacts have been reduced on the INEEL and surrounding area since the 1995 EIS.

8. Changes in Regulatory Requirements.

What changes in regulations that have occurred (air, water, etc), have reduced potential impacts at least in the short term.

9. Other NEPA

Several EAs and EISs have been prepared that tier from the 1995 EIS that analyze existing or proposed INEEL facilities and operations. These are the Advanced Mixed Waste Treatment Project EIS, EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel, Nuclear Infrastructure EIS, and Idaho High Level Waste and Facilities Disposition EIS. The Idaho HLW EIS also integrates the analysis of CERCLA and RCRA actions to comprehensively analyze impacts for environmental restoration and waste management. Each of these EISs analyzes the impacts of the actions within their scope as they contribute incrementally to INEEL cumulative environmental impacts. Except for reactor operations, all actions analyzed in these EISs were anticipated and addressed in the 1995 EIS.

Summary of Major impacts

Of the projects analyzed in the 1995 EIS some are no longer operating and of the planned projects some have not occurred. The section on cumulative impacts and Impacts from Connected or Similar Actions provides a summary of the operational changes that have occurred since 1995. As a result short-term impacts have in general been less than projected in the 1995 EIS. In addition, the long-term impacts associated with land disturbances have also been less. The potential long-term risk to workers, the public and the environment remains extremely low even though this risk may be long-term. The impacts resulting from wildfires on the INEEL since 1995 were not anticipated in the 1995 EIS. However, again no long-term loss of productivity within the ecological environment on the INEEL is anticipated. Wildfires often times result in a long-term increase in productivity within ecological environments. The wildfire impacts to facility operations on the INEEL resulted in no long-term changes.

This SA acknowledges that several flood studies have been conducted on the INEEL but that there is a degree of uncertainty associated with flooding and overland flow. There is also a difference of opinion between the United States Geological Survey and the Bureau of Reclamation that is fully described in the HLW & FD EIS. Again, although the potential exists for short-term impacts, the existing studies show minimal potential impact on long-term productivity.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

8-1.18 Socioeconomics

Scope of 1995 Analysis

The 1995 EIS, sections 4.3 and 5.3, provided an analysis of the socioeconomic impact to the surrounding counties of the INEEL primarily from any increases in INEEL employment. Based on Alternative B, any increases in employment would be offset by a declining workforce because of shrinking federal budgets experienced at the time in other DOE programs.

Changes in the Environmental Discipline

1. Methodology

Socioeconomic impacts in the 1995 EIS basically relied on compilation of statistical data from the government and internal sources. This socioeconomic data/information including potential declining outyear budgets and employment reductions were used to establish a basis and then this basis was adjusted by the potential needs and requirements (increased employment) outlined in the1995 EIS.

2. Assumptions

The relevant assumption was that any additional employment planned in the1995 EIS would offset declining employment in other program areas at the INEEL i.e., no major overall employment impacts were expected, thus no material socioeconomic impacts to the region were projected.

3. Analytical Methods

Statistical forecasting provided by government and internal sources. Qualitative estimating based on information relevant at the time.

4. Data Adequacy

Data/information provided in the1995 EIS covered the major areas of concern regarding socioeconomics.

5. Accident scenarios - None N/A

6. Accident probabilities - None N/A

7. Cumulative Impacts

The 1995 EIS projected minimal/immaterial changes in the area of socioeconomics. Any additional employment (impacts) would be offset by other INEEL programs that were declining due to shrinking budgets.

8. Changes in Regulatory - None N/A

9. Other NEPA Analysis for INEEL operations - N/A

In the 1995 EIS the following selected data was derived from table F-1-7 from page F-1-16:

Table 8-1.18.1 Total Employment

	1994	1995	2000
Total direct Employment from the INEEL	10,729	8,620	7,254

As expected, in 1995 employment levels decreased nearly 20% from 1994 to 1995 due to federal budget reductions. The year 2000 estimate of 7,254 was based on out-year projections. Alternative B (table F-1-1, page F-1-10) estimated that 1,062 jobs would result from this alternative. Using this data, the projected direct employment was estimated to be 8,316.

7,254	No action
1,062	Alternative B
8,316	Projected 2000 employment level.

Summary of Major Impacts

The 1995 EIS Alternative B projected minimal socioeconomic impacts beyond 1995 since employment levels would be nearly the same as they were in 1995 (8,620 in 1995 and 8,316 Alternative B projected for the year 2000).

The document titled "INEEL Impacts 2000" published by the Department of Energy, Idaho Operations Office, shows total INEEL employment in 2000 was 8,155 people. A comparative analysis between the 3 sets of employment numbers to the current socioeconomic conditions and the continued growth seen in the region of influence and lack of any known direct adverse socioeconomic impacts, supports the 1995 EIS conclusions that minimal socioeconomic impacts have resulted from implementation of the Alternative B decision.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

Table 8-1.18.2 Projected Employment

	1995 Actuals	2000 (projected in 1995 EIS)	2000 (Actuals based on "INEEL Impacts 2000")
Direct Employment	8,620	8,316	8,155

References:

1. INEEL Impacts 2000

8-1.19 Traffic and Transportation

Scope of the 1995 EIS

Transportation analysis of all four alternatives was performed in sections 4.11 and 5.11 in the 1995 EIS. Each of the alternatives provided analysis of associated shipments for that alternative.

The selection of a specific alternative or a change in the time frame for the alternative would have little or no affect on specific characteristics (external dose rate, route of travel, etc.) of individual shipments since these items are controlled by federal regulations.

Transportation impacts can be radiological (involving exposure to or release of radioactive material) or nonradiological (physical impacts resulting in injuries or fatalities). Nonradiological impacts are independent of the cargo and depend primarily on routing, accident rates for selected routes, and number of shipments. Radiological impacts can be accident impacts or non-accident impacts. Non-accident impacts are primarily a function of the external dose rate from the shipping container, routing (which includes distances and population densities), and the number of shipments. Accidents impacts depend on the physical/chemical/radiological characteristics of the cargo, routing, number of shipments, accident severity, release fractions, atmospheric dispersion, population densities and other pathway factors.

Changes in the Environmental Discipline

Alternative B of the 1995 EIS provides estimated number of shipments for a number of options (potential shipping destinations) that have not been utilized to date. This is not to say they will not be utilized in the future, but rather that to date there have been no actual shipments on which to base a comparison. For those options and categories that have been utilized, a comparison is made to the option B estimates to determine that actual shipments (a shipment consists of all material on one shipping paper, bill of lading, or manifest) are within the estimates. The estimated number of shipments for Alternative B was obtained from EIS tables 5.11-4 and 5.11-5, and compared to the actual number of shipments from the past year. The 1995 EIS tables show estimates for making both 100% of the shipments by Truck and for making 100% of the shipments by rail. The actual shipments shown are 100% by truck. The comparison is as follows:

Table 8-1.19.1 Spent Nuclear Fuel Shipments

Spent Nuclear Fuel	Number of Shipments Forty year totals from Alternative B table 5.11-5		Actual in 2000	
	By Truck	By Rail	By highway	By Rail
Naval[a]	3024		0	5
University[b]	519	519	0	0
Foreign[b]	1008	1008	7	1
DOE[b]	743	297	3 (ANL)	0
Onsite[c]	1764	0	4	0

a Includes offsite and onsite shipments. Naval shipments would be made using a combination of truck and rail transport.
b Shipments based on 100 percent transport by truck or 100 percent transport by rail.
c Onsite shipments generally are made by truck only.

Table 8-1.19.2 Shipments of Radioactive Waste and Hazardous Materials

Material	Number of Shipments Ten year totals from Alternative B table 5.11-4[d]		Actual in 2000
Transuranic Waste	By Truck	By Rail	Total
INEEL to WIPP	4,317	1,695	26[a]
Rocky Flats to INEEL	830	326	0
ANL-E to INEEL	207	104	0
INEEL to PSF	5,434	2,206	0
PSF to INEEL	2,495	980	0
INEEL to Hanford	0	0	0
NTS to INEEL	0	0	0
SNL to INEEL	0	0	0
LANL to INEEL	0	0	0
Low-level waste			
INEEL to PSF	710	355	0
PSF to INEEL	23	12	0
INEEL to NTS	0	0	0
Rocky Flats to INEEL	0	0	0
LANL to INEEL	0	0	0
PANTEX to INEEL	0	0	0
SNL to INEEL	0	0	0
ITRI to INEEL	0	0	0
Mixed Low Level Waste[b]			20
INEEL to NTS or Hanford	0	0	0
Rocky Flats to INEEL	0	0	0
LANL to INEEL	0	0	0

PANTEX to INEEL	0	0	0
ETEC to INEEL	0	0	0
Onsite radioactive waste	1,365		115

a. The 26 shipments to WIPP in 2000 includes 8 TRU mixed waste shipments
b. None of the actual 20 mixed waste shipments in 2000 had both an origin and destination comparable to those from table 5.11-4.
c. WIPP = Waste Isolation Pilot Plant, ANL-E = Argonne National Laboratory – East, PSF = Private Sector Facility, NTS = Nevada Test Site, SNL = Sandia National Laboratories, LANL = Los Alamos National Laboratory, ITRI = Inhalation Toxicology Research Institute, ETEC = Engineering Technology Engineering Center.
d. Shipment counts represent 100 percent by truck or 100 percent by rail, except for onsite shipments that only use truck.

The 1995 EIS provides estimated annual vehicle miles traveled by DOE vehicles. A comparison is made to the estimates from table 4.11-2 of the 1995 EIS, to the actual miles traveled by DOE vehicles in 1999 as obtained from BBWI Fleet Management, to determine that actual miles traveled are within the estimates. The 1999 miles represent all miles for DOE vehicles regardless of the facility, project, or operation they were supporting.

Table 4.11-2 of the 1995 EIS also provides the miles driven per year, related to SNF, ER, HLW, and WM, by commercial vehicles as 905,900 miles total. As means of comparison, based on DOE Enterprise Transportation Analysis System (ETAS), in the year 2000 there were 2305 commercial vehicles that delivered and or picked up material in connection with all INEEL operations. This mileage represents all mileage for all BBWI programs projects and facilities at the INEEL, not just those within the scope of the EIS. This includes express carriers (such as Federal Express, Air Borne Express, and UPS) for hire carriers (such as TRISM, Yellow Freight, and Consolidated Freight, City Express), vendors (such as Gas House, Bangs Office Supply, and Bowen Petroleum) and House Hold movers and air-ride vans (such as United Van Lines and Wheaton Van Lines). Most of these commercial vehicles are involved in delivering materials where the INEEL would be only one of numerous customers to whom deliveries are made on any given day/trip. Accordingly miles driven, related to the INEEL, per vehicle would be the distance from their dispatch points in the surrounding communities to the INEEL and return to their dispatch point. The dispatch points for virtually all the commercial vehicles are located in Idaho Falls (55 miles from the INEEL Central Facilities Area) or Pocatello (60 miles from the INEEL Central Facilities Area). The INEEL related commercial vehicle miles traveled last year can be approximated by multiplying the number of commercial vehicles that delivered to and or picked up material from the INEEL by the average round trip miles from dispatch point to the INEEL delivery point, and return, or:

(2305 commercial vehicles) X (120 miles) = 276,600 commercial vehicle miles

Table 8-1.19.3 Vehicle miles traveled for traffic related to the INEEL

Type of vehicle	Miles traveled per year Estimated from EIS	Actual in 2000
DOE Busses	6,068,200	2,903,021

Other DOE vehicles	9,183,100	Light vehicles 6,251,561 Trucks 382,014 Total 6,633,575
Commercial vehicles	905,900	276,600

The comparison shows that the miles traveled per year by DOE vehicles and commercial vehicles in relation to the INEEL are well within the original estimates used for the EIS.

The 1995 EIS considers only radioactive shipments connected to SNF, ER, and WM projects, for the transportation analysis. To provide comparison, the number of radioactive shipments from all projects and facilities over a five-year time period was obtained from the DOE Enterprise Transportation Analysis System (ETAS) and is provided for comparison EIS. The table below compares the estimated number of radioactive shipments from the EIS specific to SNF, ER, and WM and compares that number to the actual number of radioactive shipments from all programs, projects, and facilities per year (per ETAS) times 10.

Table 8-1.19.4 Total Radioactive Shipments

EIS Estimate for specific operations from table 5.11-4, 5,381 shipments (a ten year estimate) plus (+) Table 5.11-5, 7,058 shipments (a 40 year estimate adjusted to a ten year estimate, 7,058 divided by 4) 7,058 divided by 4 = 1,764 (5.11-5 10 year total) + 15,381 (5.11-4 10 year total) = 17,145. Radioactive shipments from the 1995 EIS tables 5.11-4 & 5.11-5 (10 year time frame) = 17,145
Actual radioactive shipments for all programs projects and facilities for the following years. 1996 = 299 1997 = 331 1998 = 278 1999 = 167 2000 = 180 actual 5 year total 1255 Total shipments for the five year time frame = 1,255 Times 2 to make it comparable to the EIS 10 year time frame = 2,510

This figure Includes TRU waste shipments to WIPP, mixed waste shipment from Sandia, mixed waste shipment from Paducah, mixed waste shipments to Treatment/Storage/Disposal (TSDs), long haul shipments, and miscellaneous shipments; to Massachusetts, Pennsylvania, New Jersey, Maryland, Tennessee, South Carolina, Louisiana, Oklahoma, Texas, Colorado, California, and Washington (shipments include samples, sources, instrumentation, empty packagings, etc.)

The comparison shows that the total number of radioactive shipments, over a five year period, for all programs, projects, and facilities is well within the original estimates used for the EIS.

Summary of Major Impacts

For purpose of comparison, the number of shipments (1,255) and vehicles miles traveled (9,813,196) related to the INEEL, during the past five years are well within the bounded number of shipments (17,145) and miles (16,157,200) analyzed in the 1995 EIS.

The analysis in the 1995 EIS provides a bounding analysis for the environmental impacts in this discipline. Additional analysis for this discipline is not required.

References:

1. DOE-AL Enterprise Transportation Analysis System

8-1.20a Water Resources - Ground Water

Scope of the 1995 Analysis

The water resources section of the 1995 EIS addressed both possible flood hazards and ground water impacts from INEEL operations. These two topics are addressed separately in this Supplement Analysis document.

Section 4.8 of the 1995 EIS addresses the water resources of existing activities on the INEEL, and section 5.8 addresses the estimated impacts from proposed actions. The 1995 EIS ground water analysis was based on two primary pieces of information. The first is the 1994 RWMC Performance Assessment (1994 PA). The second is the ground water monitoring data that was available in 1994. The analysis included monitoring data tabulation and modeling to assess water resources with respect to potential impacts of the activities delineated in the 1995 EIS. The geology and water resources methodologies and assumptions are detailed in Appendix F-2 in Volume 2 of the 1995 EIS. Preliminary predictions of groundwater impacts from other areas and activities (INTEC, TAN, TRA, and RWMC) were presented with detailed analyses deferred to future characterization activities.

The result of the NEPA analysis showed hazardous constituents in the ground water at TAN, TRA, INTEC, and in the subsurface at RWMC. The potential radioactive plume projected to emanate from the RWMC was projected to result in a maximum exposure rate to the public of 0.60 mrem/yr by the year 2060. This information was based on the Performance Assessment (PA) for the active LLW disposal facility (Pits 17 – 20, disposal vaults) at the RWMC. The buried ER wastes were addressed and the statement was made that federal drinking water standards would not be exceeded through 2005. Also addressed were the iodine-129 (I-129), tritium (H-3), and strontium-90 (Sr-90) plumes from TRA and INTEC, and the trichloroethylene plume from TAN.

The 1995 EIS acknowledged that additional analysis was needed in order to fully understand the ground water impacts to a maximally exposed member of the public. Reference was made to the ongoing Remedial Investigation and Feasibility Study for WAG 7 (INTEC). No credit was given for any activities at the Pit 9 project or the Test Area North (TAN) pump and treat remediation project.

Water use and discharge data is analyzed in the INEEL Services section of this appendix.

Changes in the Environmental Discipline

1. Methodology

The 1995 EIS concluded that possible groundwater impacts were not by themselves a discriminating factor in the weighting of alternatives.

Since the 1995 EIS was published a great deal of analysis and remediation has been completed on ground water for the INEEL. The remediation includes removal of volatile organics from the vadose zone at RWMC and the removal of contaminated groundwater from the TAN injection well through pump and treat processes. Other changes include the use of bioremediation in cleaning up the TAN TCE plume, which has been so successful that the ROD is being amended to recommend bioremediation for the most contaminated portion of the plume.

Other more recent analyses include the 2000 update to the RWMC Performance Assessment (2000 PA), development of the RWMC Composite Analysis (CA), the WAG 3 (INTEC) Remedial Investigation and Feasibility Study, the draft HLW & FD EIS and the ongoing analysis for the Waste Area Group 7 (RWMC) Remedial Investigation and Feasibility Study (WAG 7 RI/FS). The HLW & FD EIS groundwater characterization and impacts analyses rely heavily on the data and modeling results contained in the 1997 WAG-3 Remedial Investigation and Feasibility Study for the INTEC. The 2000 Composite Analysis provides significantly more detail regarding the groundwater impacts of INEEL activities.

The 2000 PA addresses the potential maximum environmental impacts to a member of the public from the active LLW disposal facility. The CA addresses the potential maximum environmental impacts to a member of the public from all sources of radiological contamination in the subsurface at the INEEL, including the active disposal facility.

2. Assumptions

The primary assumptions from the1995 EIS are similar to those that are currently used in the RWMC 2000 Performance Assessment. The agricultural scenarios and intruder scenarios for receptors are essentially the same. Key assumptions for the INTEC/TRA models included; meteorological data for vadose zone transport rate analyses, retardation coefficient (kd) values, a transport time of three years through the vadose zone to the aquifer, and that there would be no intentional surface or subsurface discharges exceeding DOE standards. The TAN TCE model assumed an infinite source of TCE and identified TCE as a major potential contaminant of concern. Subsequent analyses indicate that in-situ bioremediation is significantly attenuating the distal TAN TCE plume. The robust and defensible documentation of this attenuation has led to the generation and acceptance of alternative remediation strategies for the TAN TCE plume. Other assumptions are delineated in Appendix F-2 in Volume 2.

Some significant changes in assumptions for RWMC groundwater modeling since 1994 include: the adjustment of the retardation coefficient (Kd) for uranium from 1000 mL/g to 6 mL/g, the inclusion of source terms from the entire Subsurface Disposal Area, and the development of a more sophisticated release model for buried waste.

A key assumption in the 1995 EIS regarding the recession of contaminant plumes on the INEEL seems to have been verified by data and models contained in the CA. However, the WAG 3 RI/FS indicates that the I-129 plume could reach the INEEL southern boundary at or above the 1 pCi/l MCL. It is also important to note that aquifer risks were characterized with respect to impacts at the site boundary in the 1995 EIS. Thus, more potential contaminants of concern will be identified in analyses (such as the WAG 3 RI/FS) that seek to identify threats to the aquifer.

3. Analytical Methods

The 1995 EIS used MODFLOW and its MT3D fate and transport module for INTEC/TRA 2-d saturated zone contaminant transport characterization. The GFLUX 1-d unsaturated zone contaminant transport code was used to numerically introduce contaminants into the saturated zone. This modeling process has been replaced by the use of the TETRAD multi-phase flow and transport simulator. The MODFLOW/PORFLOW or GWSCREEN approach is arguably limited by the 1-d assumptions required for vadose zone transport but has reasonably fast computation times. TETRAD has the capability to fully capture 3-d geohydrologic and source term effects on coupled saturated and unsaturated zone fate and transport. Lengthy computation times limit the range of sensitivity analyses that can be done and assumptions have to be made regarding the geohydrologic structure in 3 dimensions.

The TAN and RWMC models (FLASH/FLAME and PORFLOW respectively) were used in the 1995 EIS and have subsequently been replaced by the TETRAD simulator.

4. Data Adequacy

Since the 1995 EIS, new monitoring data is available for further refining fate and transport history matching. RWMC data gathered since the 1995 EIS analyses will be crucial in assessing 1995 EIS assumptions. Additional data on point source releases of water to the vadose zone at the INTEC is now available and summarized in the 1997 WAG-3 RI/FS. This new water input is in part responsible for the modeled peak aquifer concentration of Sr-90 of 16 pCi/l. TRA operations will not contribute to further potential for ground water contamination unless decisions are made to D & D the MTR and ETR reactors in place. New data demonstrating the effectiveness of in-situ bioremediation in the distal TAN TCE plume is now available.

The source term data that was used in the1995 EIS is the same source term data that was used in the 94 Performance Assessment. That data came directly from the RWMIS database maintained by the Waste Management organization. Since then, a number of efforts have been made to more accurately characterize some of the remote-handled waste received from TRA and from NRF. This has resulted in another revision to the database. As a result of these changes, the data quality has been upgraded since the1995 EIS. The CIDRA database is an example of additional data that is now available for refining source term estimates.

The ground water monitoring results comparing data from the 1995 EIS and maximum ground water monitoring results from 1995 - 1999 is shown in Table 8-1.20.1. The table shows decreased contaminant levels for most contaminants. The contaminants that show increases are for inorganic salts around the Mud Lake area (not attributable to INEEL actions) and for carbon tetrachloride. The receding plume observation cited in the 1995 EIS is justified given the data set for H-3 and Sr-90 but problematic for other radionuclides due to sporadic sampling. The CA model calibration ignored the impacts of sporadic and isolated contaminant detections on model parameters. This assumption is reasonable in light of the model's main objective which is to capture the large scale behavior of contaminants that are consistently detected.

5. Accident Scenarios

One scenario was analyzed in the 1995 EIS in which a HLW tank was postulated to simultaneously release 1,300,000 curies of Sr-90 in 300,000 gallons of water at the surface. Assuming only meteorological input, the maximum modeled aquifer concentration of 2 pCi/l (MCL=8 pCi/l) occurred in the model 300 years after the release.

The intruder and inadvertent intruder scenarios that were described in the1995 EIS are essentially the same as are currently used in the 2000 PA. The CA uses a different set of exposure scenarios than the PA (in accordance with the DOE guidance on development of a CA).

6. Accident Probability

No probabilities are assumed in the PA and the CA. The analysis assumes that the intrusion into the facility takes place and analyzes the impact of the intrusion.

7. Cumulative Impacts

The PA and the CA evaluate doses in a number of different scenarios and in comparison to a number of different criteria. These documents are available in the source documents for this Supplement Analysis. The all-pathways dose will be shown here as a representative example of the maximum calculated dose.

Additional analysis is required to address all of the buried radiological source terms across the site. This analysis could be compiled from the existing Composite Analysis (CA) and other NEPA and CERCLA documents. However, use of the existing CA is problematic because it does not address all of the buried wastes across the INEEL.

In the near term, the 2000 PA shows a dose to a maximally exposed member of the public from the all-pathways dose of 0.0022 mrem/yr through 2120. This compares to the 1995 EIS which shows a dose of 0.60 mrem/yr through 2060. The CA shows an all-pathways dose from all buried waste of 0.07 mrem/yr through 2120. The long-term analysis shows doses of 17 mrem/yr (at 10,000 years - 1994 PA), 15.9 mrem/yr (at 10,000 years – 2000 PA), and for all sources of contamination 30 mrem/yr (at 3000 years – CA).

8. Changes in Regulatory Environment

The primary regulations governing ground water, the Safe Drinking Water Act and the Clean Water Act, have not significantly changed in the previous five years. The designation of the Snake River Plain Aquifer as a sole source aquifer in 1991 did not appreciably change regulatory requirements for INEEL actions. These have not changed in the previous five years.

The 1994 PA was written to the requirements of DOE O 5820.2A. The 2000 PA was written to DOE O 435.1 which has recently replaced DOE O 5820.2A but imposes similar requirements for a PA analysis. The CA is relatively new and the requirements for it are found in DOE O 435.1. Additionally, the creation of the WAG-10 (site-wide) aquifer characterization unit creates opportunities and issues with respect to the integration and coordination of groundwater characterization and remediation strategies.

9. Other NEPA Analysis for INEEL Operations

The HLW & FD EIS is now near completion which incorporates WAG 3 RI/FS groundwater data and modeling results.

Summary of Major Impacts

The 1995 EIS addressed existing groundwater plumes from the TRA, INTEC, TAN, and RWMC. It also provided estimates of ground water doses from the ongoing low-level waste disposal activities at the RWMC. The 1995 EIS showed a dose of 0.60 mrem/yr attributable to the LLW disposal facility through the year 2060. It also stated that results of the preliminary risk assessment for buried wastes indicate that contaminants would not reach the INEEL site boundary exceeding Federal primary drinking water standards through 2005. Additional analysis completed since the 1995 EIS confirms that these statements are still valid. The projected groundwater dose from all buried waste at the RWMC is 0.07 mrem/yr through 2120.

The 1995 EIS stated that additional work was required in order to understand ground water impacts from INEEL operations. Since that time, additional analysis has been completed that addresses some of the unknowns but additional work is still required. The RWMC Composite Analysis (CA) has been completed since the 1995 EIS was published along with updates to the RWMC Performance Assessment. These have addressed one of the major groundwater analysis needs: further definition on the balance of the buried waste at the RWMC. The WAG 3 RI/FS has also been completed since the 1995 EIS and provides another major piece of the groundwater analysis such as impacts from spills at the INTEC. (It should be noted during the discussion of groundwater impacts, that there is a great deal of uncertainty in groundwater modeling and impacts. Most models calculate results conservatively because they cannot duplicate actual transport mechanisms through the vadose zone. These transport processes are highly complex especially in an environment like the INEEL where fractured basalt, rift zones, geothermal activity, and sedimentary interbeds all play a part in fate and transport of contaminants. Analysis done to date has consistently used conservative assumptions in performing this analysis.)

Decontamination and decommissioning (D & D) decisions on ultimate disposition of radiologically contaminated facilities have the potential to add significant source term that may increase the long-term dose reflected in the Composite Analysis. From a site-wide cumulative impacts standpoint, the D & D impacts on the long-term ground water dose are uncertain. D & D decisions must take into account cumulative impacts on groundwater dose estimates. The additional analysis that is needed is a site-wide Composite Analysis in accordance with DOE O 435.1. This information will be used to address some of these uncertainties.

While additional work is required beyond 2005 and for D&D decisions, the conclusions of the 1995 EIS (see page 5.8-4 in the 1995 EIS) are adequate to support the ROD. Actual ground water monitoring data shows decreasing contaminants across the INEEL with the exception of inorganic salts (from agricultural sources in the Mud Lake area) and carbon tetrachloride, which is being addressed through CERCLA remediation actions.

The analysis in the 1995 EIS was adequate for DOE decisions announced in the ROD. Future DOE decisions on major federal actions on the INEEL, or decisions deferred in the ROD, will require additional analysis for this discipline.

References:

1. Technical Revision of the Radioactive Waste Management Complex Low-Level Waste Radiological Performance Assessment for Calendar Year 2000, INEEL/EXT-2000-01089, September 2000

2. Radioactive Waste Management Complex Low-Level Waste Radiological Composite Analysis, INEEL/EXT-97-01113, September 2000

3. E-mail from Leah Street, INEEL Ground Water Monitoring Data, Data Qualifiers, and updated Maximum Contaminant Levels, 4/11/01

4. Comprehensive RI/FS for the Idaho Chemical Processing plan OU 3-13 at the INEEL – RI/BRA Report (Final), DOE/ID-10534, Nov. 1997

5. Draft Record of Decision Amendment for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action, DOE/ID-10139 Amendment, July 2001

Table 8-1.20.1 Summary of highest detected contaminant concentrations in groundwater within the INEEL site 1995 – 2000

Parameter	Highest detected recent concentration through 2000	Recent boundary concentration through 2000	Highest detected recent concentration through 1995[g]	Recent boundary concentration through 1995[g]	Current maximum contaminant level[g]	Derived concentration guide[g]
Radionuclides in picocuries per liter						
Americium-241	< detection limit (1998)[a]	< detection limit	0.91 (1990)	< detection limit	15	30
Cesium-137	< detection limit (1998)[a]	< detection limit	2,050 (1992)	< detection limit	200	3,000
Cobalt-60	< detection limit (1998)[a]	< detection limit	890 (1987)	< detection limit	100	10,000
Iodine-129	3.82 (1990)[b]	0.00083	3.6 (1987)	0.00083	1	500
Plutonium-238	< detection limit (1998)[a]	< detection limit	1.28 (1990)	< detection limit	15	40
Plutonium-239/240	< detection limit (1998)[a]	< detection limit	1.08 (1990)	< detection limit	15	30
Strontium-90	76 (1995)[c]	< detection limit	640 (1992)	< detection limit	8	1,000
Tritium	25,100 (1995)[c]	310	48,000 (1988)	Background	20,000	2,000,000
Nonradioactive metals in milligrams per liter						
Cadmium	0.002 (1998)[a]	Background	0.0073 (1992)	Background	0.005	Not applicable
Chromium	0.168 (1998)[a]	Background	0.21 (1988)	Background	0.1	Not applicable
Lead	0.02 (1998)[a]	Background	0.009 (1987)	Background	0.015	Not applicable
Mercury	0.0006 (1995)[c]	Background	0.0004 (1987)	Background	0.002	Not applicable
Inorganic salts in milligrams per liter[1]						
Chloride	267 (1997)[d]	Background	200 (1991)	--	250	Not applicable
Nitrate	11 (1995)[c]	Background	5.4 (1988)	Background	10	Not applicable
Sulfate	270 (1995)[e]	Background	140 (1985)	Background	250	Not applicable
Organic compounds in milligrams per liter						
Carbon tetrachloride	0.0072 (2000)[f]	Background	0.0066 (1993)	< detection limit	0.005	Not applicable
Chloroform	0.0012 (2000)[f]	Background	0.951 (1988)	< detection limit	0.1	Not applicable
1,1-dichloroethylene	0.0011 (1996)[f]	Background	0.009 (1989)	< detection limit	0.007	Not applicable
Cis-1,2-dichloroethylene	0.05 (1996)[f]	Background	3.9 (1992)	< detection limit	0.07	Not applicable
Trans-1,2-dichloroethylene	0.02 (1996)[f]	Background	2.6 (1988)	< detection limit	0.1	Not applicable
Tetrachloroethylene	0.046 (1996)[f]	Background	0.051 (1992)	< detection limit	0.005	Not applicable
1,1,1-trichloroethylene	0.0076 (1996)[f]	Background	0.012 (1989)	< detection limit	0.2	Not applicable
Trichloroethylene	0.99 (1996)[f]	Background	4.6 (1992)	< detection limit	0.005	Not applicable
Vinyl Chloride	<0.0002[f]	Background	0.027 (1989)	< detection limit	0.002	Not applicable

Note 1: The inorganic salts were detected in wells at the northern portion of the INEEL. This is indicative of agricultural fertilizers used by farmers in the Mud Lake area.

a	Bartholomay, Tucker, and others (2000)	DOE/ID-22167
b	Mann and Beasley (1994)	DOE/ID-22115
c	Bartholomay, Tucker, et.al. (1997)	DOE/ID-22137
d	Bartholomay, Knobel, et.al. (2000)	DOE/ID-22165
e	Bartholomay, Knobel, and Tucker (1997)	DOE/ID-22143
f	USGS database – www.water.usgs.gov/nwis/, this data is for wells extending into the aquifer	
g	1995 EIS, Table 4.8-1	

8-1.20b Water Resources – Surface Water

Scope of the 1995 Analysis

The water resources section of the 1995 EIS addressed both possible flood hazards and ground water impacts from INEEL operations. These two topics are addressed separately in this Supplement Analysis document.

Section 4.8 of the 1995 EIS addresses the water resources of existing activities on the INEEL, and section 5.8 addresses the estimated impacts from proposed actions. Flood hazard characterization in the 1995 EIS was limited to the Mackay dam failure scenario, which is considered to be a bounding accident. Structural failures were assumed to be insignificant due to the shallow depth and low flow velocity and the low probability of the initiating event. Subsequent flood hazard studies and their implications are discussed in the HLW & FD EIS.

1. Methodology

Flood Hazard characterization methodology is described in detail in Appendix F-2 in Volume 2. The primary source for the 1995 EIS flood hazard analysis was the Koslow and Van Haaften (1986) Mackay dam failure analysis. This report relied on the DAMBRK one-dimensional (1-d) flood routing model (developed by the National Weather Service) to simulate 4 scenarios; seismic dam failure, hydraulic (piping) failure of the dam with a 100 year flood, hydraulic failure with a 500 year flood, and overtopping failure with a probable maximum flood. DAMBRK was validated with data from actual dam failures including the Teton Dam failure.

This report also included an analysis of local basin snowmelt effects with a combined rain and snowmelt water availability of 2.74 inches per day. This analysis concludes that there is no threat to INEEL facilities from local runoff resulting from the simultaneous occurrence of heavy rains and melting snow. Local basin snowmelt flooding is identified in the 1995 EIS as a problem which can be alleviated through adequate hydrologic design, construction and maintenance. Subsequent analyses for the RWMC provided design parameters for the 100-year precipitation event occurring for 24 hours (Zukauskas, 1992). The 1992 study concluded that minor modifications would result in adequate control of surface water flooding at the RWMC from these events. These modifications have been completed.

Current sub-surface water quality analyses at the RWMC could represent the integrated results of surface water flooding and infiltration. These analyses (the Composite Analysis and 2000 Performance Assessment for example) and models tend to show limited risks (depending on receptor location) resulting in part from RWMC surface water flooding. Similar analyses at TRA and INTEC are complicated by process and other water releases that amplify natural sources of infiltration water. Similarly, flow in the Big Lost River that might impact INTEC perched aquifers is controlled by irrigation demands and INEEL Diversion Dam operations, not natural processes.

2. Assumptions

The most heavily weighted assumption underlying the data analyzed in the 1995 EIS is that all the hypothetical risks from flooding would come from structural failure. The total risk from other flood hazard related contaminant migration modes cannot be formulated until the probabilities and magnitudes of the initiator events (floods) are rigorously determined consistent with DOE standards. There are no significant technical barriers to characterizing the INEEL flood hazard risk per DOE standards.

Detailed surface water analysis technical assumptions are provided in Appendix F-2 of the 1995 EIS. The Koslow and Van Haaften (1986) study did include sensitivity analyses for the parameters related to dam failure time and breach bottom width, which are responsible for most of the uncertainty in forecasting dam break floods. Variations in Manning's n (a surface roughness estimate assumed to range from 0.030 – 0.060) and flow losses (due to infiltration and net flow away from the main channel assumed to be 40%) result in small changes in peak flood arrival time and flood elevation (0.4 feet increase in flood elevation for a 20% decrease in assumed infiltration rate for example).

The Big Lost River has to make an almost 90 degree left turn at the INEEL Diversion dam in order to continue on to the central part of the INEEL. Without making the left turn, the Big Lost River flows almost straight into the INEEL spreading areas. Modeling the change in Big Lost River flood momentum at the INEEL Diversion Dam is problematic but it was conservatively estimated that flow into the INEEL spreading areas was only a function of elevation. It is likely that a flow model that fully captures flow momentum would have shown more water entering the spreading areas.

Although the actual stability and probability of failure of the Mackay dam under the different scenarios is unknown, it was assumed in this conservative calculation that the probability of failure under each of these conditions is 1.

3. Analytical methods

The 1986 Koslow and Van Haaften study used in the 1995 EIS relied on 1-d hydraulic models of dam failure assigned a probability of 1, subject to loads with varying probabilities. Although the DAMBRK code used by Koslow and Van Haaften (1986) is 1-d, it is more dynamic than most 1-d codes. DOE standards (as well as the rigorous computation of risk) require that explicit probabilistic formulation of flood hazard frequencies (including the propagation of uncertainty) be computed for each potential flood hazard mode (river flooding dam failure, surface run-off, etc.). Thus, the 1986 Mackay Dam failure analysis provides extremely conservative frequency estimates for flooding events because the probability of dam failure under all scenarios is assumed to be 1.

Subsequent flow frequency estimates (such as the USGS WRI 96-4163 report) obtain 100 and 500-year flow estimates by assigning a probability of 1 for various events with extremely small real probabilities. The U.S. Bureau of Reclamation (BOR) recently completed a fully probabilistic flood hazard analysis of the Big Lost River consistent with DOE standards (Ostenaa, et al., 1999). Multiple INEEL reviews of this study are documented in the HLW & FD EIS project files. The defensibility of this study is also demonstrated by publication in the peer-reviewed literature of four articles resulting from this work. Additional work by the USGS and BOR to evaluate flow frequency estimates is being completed. Summaries of the USGS and BOR work are presented in the HLW & FD EIS.

4. Data adequacy

The flood hazard data in the 1995 EIS is incomplete. Before impacts can be analyzed, defensible flood frequencies and magnitudes have to be determined. The DAMBRK 1-d code establishes flood flow levels in the context of deterministic dam failure modes, 1-d flow, and low resolution contour data. Risks for contaminant release should be analyzed. The first element in such an analysis is the determination of the combined mean flood hazard in a probabilistic context per DOE standards.

The BOR INEEL flood hazard characterization (Ostenaa, 1999) meets all NRC and DOE QA/QC requirements and is the only study consistent with the DOE flood hazard characterization standards. In addition to extensive INEEL and external peer review, the BOR analysis incorporates Big Lost River stream gauge data, paleohydrologic data, extensive radiocarbon dating, 2-d hydraulic modeling to develop flow estimates constrained by high resolution geologic and radiocarbon data, statistical analyses incorporating Bayesian updating and maximum likelihood functions, and extensive sensitivity analyses. All of these elements are consistent with or required by DOE standards. The BOR study also avoids the effects of system regulation, which complicate traditional flow frequency analyses by extending the hydrologic record into pre-historic times. The depth, frequency, and quality of independent review of the BOR report is documented in the HLW & FD EIS project files.

The BOR report also uses new geomorphologic data to establish that the “outburst flood” was in fact either much less in magnitude than previously thought and/or occurred at a much earlier time (over 100,000 years ago).

USGS WRI 96-4163 (Kjelstrom and Berenbrock, 1996) attempts to mitigate the effects of reservoir regulation of the Big Lost River by using an ad hoc technique based on conservative assumptions. In particular the assumption that all 22 upper subbasins empty instantaneously at the Arco gauging station and that no flood water is lost from Arco to the diversion dam is not supported by factual observations and lack quantitative assessments regarding the impacts of these assumptions on the uncertainty in flow frequency estimates. While reviewed internal to the USGS, WRI 96-4163 has no documented external review associated with it. This as well as other limitations has led the USGS to propose additional work to refine their previous flow frequency estimates; this work is presently underway.

The BOR 100 year flow is 2,917 CFS while the USGS 100 year flow 7,260 CFS. The BOR 20,000 year flow is 5,012 CFS. The present capacity (based on a geotechnical analysis using tensiometer and standard penetration test data) of the INEEL diversion dam is 6,000 CFS (factor of safety = 1.91). The INEEL diversion dam is not certified as a flood control structure and is therefore numerically "erased" for FEMA type flood plain modeling.

Two-dimensional (2-d) flow models are required to understand flood impacts on the INEEL. Previous 1-d models conserve flow between cross sections or rely on infiltration only to account for flow losses. The topography and irrigation diversion system of the Big Lost River suggest that 2-d flow models would show that there are significant flow losses in the reach from the Mackay Dam to the Big Lost River sinks. Scenarios and codes for 2-d modeling have to be carefully chosen and include; flows for return periods determined in a combined probability context (per DOE standards), robust sensitivity analyses reflecting the uncertainty of the data and parameters, sufficient memory for large scale high resolution model development, realistic viscosity terms, and initial and final conditions consistent with site geomorphology.

5. Accident Scenarios

No significant accident analysis scenarios in the 1995 EIS were related to flooding. Potential groundwater impacts of flooding at the INTEC are addressed in the HLW & FD EIS.

6. Accident Probability

DOE requirements for flooding analysis are based on flood return frequencies. Thus the probabilities for these floods have not changed.

7. Cumulative Impacts

There were no cumulative impacts identified with surface water identified in the 1995 EIS. The potential cumulative impacts of INEEL management of Big Lost River flow in the INEEL should be systematically analyzed and managed. The cumulative effects of surface water flow (natural and artificial) could be reflected in water quality and modeling results from INEEL facilities. Flood hazard mitigation, RWMC subsurface contaminant migration and INTEC perched aquifer impacts on the Snake River Plain aquifer could be optimized by systematically alternating the diversion of Big Lost River flows at the Diversion Dam to the INEEL spreading areas with periods when flows are allowed to continue downstream.

Other risk modes (such as dispersion of contaminated soils) should be analyzed. The mitigating factors with respect to these risks include: high impact floods are likely to have extremely low probabilities (see HLW & FD EIS section 4.8.1.3 on INEEL flood hazards and "Comments of the use of USGS WRI 96-4163, Estimated 100-Year Flows and Flow Volumes in the Big Lost River and Birch Creek at the Idaho National Engineering Laboratory, Idaho" in the Supplemental Analysis Administrative Record); the INEEL is an internal drainage system; and the nature of flooding and peak flood arrival times is likely to have no impact on RCRA facilities (Guymon to Kelly, 1/18/01, EDF 1747) or allow for hours or days of time to prepare for a flood peak arrival.

8. Changes in Regulatory Environment

There has been no change since 1995 in any of the statutes, but the RCRA regulations have continued to become more specific regarding flooding information in permit applications.

Recent RCRA Permit Applications have included USGS preliminary estimates of the 100-year flood plain and the State of Idaho has asked for certification that RCRA activities are or are not in the 100-year flood plain. In response to this request, INEEL & DOE-ID prepared an engineering design file and analysis (EDF-1747) showing that the Koslow and Van Haaften (1986) 100 year flow and failure of the Mackay dam and resulting flow (24,870 cubic feet per second) and elevation at the INTEC (4,916 feet) did not washout critical RCRA related structures. This response to the State (Guymon to Kelly, 1/18/01, CNN 017515) also notes that studies are ongoing to more rigorously delineate the INEEL 100 year flood.

Several environmental characterization activities required to meet regulatory requirements (such CERCLA) require the delineation of the 100-year flood plain per Federal Emergency Management Agency (FEMA) approved methodology. Several points should be made with respect to the FEMA type 100-year flood at the INEEL. First, there is no recognized procedure for determining a 100-year flood in a regulated system (see Bulletin 17-B). The Big Lost River is regulated for irrigation purposes. Second, the DOE standards are clear that USGS/FEMA type 100-year flood analyses are to be treated as screening analyses indicating the need for more thorough characterization. Third, 100 and 500-year floods have to be determined in the context of DOE standards which require the delineation of flood hazards with a combined probability of 10E-5 (100,000 year return period) for high hazard facilities such as the Advanced Test Reactor.

This last point is critical and suggests the difficulties with establishing unreasonably conservative 100-year flood estimates and the advantages of using the geologic record to establish low frequency flow bounds. For example, if a 100-year flood of 7,260 CFS is accepted, the resulting flow extrapolated out to 100,000-year return periods will result in insurmountable challenges to INEEL facilities.

An additional and most important consideration in performing and assessing flood hazard characterization methods involves the rational allocation of resources. Rigorous risk assessments cannot be performed in the absence of defensible hazard probabilities. The use of conservative or indefensible hazard probabilities could shift scarce resources away from real risk reduction and into the mitigation of less rigorously determined risks. Thus, increasing the net risk to the environment, workers, and public.

9. Other NEPA analysis for INEEL Operations

The WAG 3 RI/FS has been completed for the INTEC. The HLW & FD EIS is now near completion which incorporates WAG 3 RI/FS surface water/groundwater interaction modeling results (by reference). Impacts of Big Lost River flow and flooding on the INTEC perched aquifers and Snake River Plain aquifer have been identified in the WAG 3 RI/FS as a potential concern.

Summary of Major Impacts

Flood hazard characterization in the 1995 EIS was limited to the Mackay dam failure scenario, which is considered to be a bounding accident. Impacts were not rigorously analyzed but structural failures were assumed to be insignificant due to the shallow depth and low flow velocity at the INEEL approximately 45 miles downstream of Mackay reservoir. Because the effects of the Mackay dam failure scenario were assumed to be small, the effects of the 100 and 500-year floods were considered to be insignificant in the 1995 EIS.

Additional flood risk analysis will be required. The flood risk must be assessed consistent with flood hazard analysis prescribed in DOE standards. Specifically the 100-year and 500-year flood plains must be refined for the INEEL. DOE-ID will refine the Flood Plain documentation per 10 CFR 1022. The review determined that the flood plain analysis in 1995 was adequate for safe operation of INEEL facilities.

The analysis in the 1995 EIS was adequate for DOE decisions announced in the ROD. Future DOE decisions on major federal actions on the INEEL, or decisions deferred in the ROD, will require additional analysis for this discipline.

References:

1. Koslow, K. N. and Van Haaften, D. H., “Flood Routing Analysis for a Failure of Mackay Dam”, EGG-EP-7184, dated June 1986.

2. Zukauskas, 1992

3. USGS, “Estimated 100-Year Peak Flows and Flow Volumes in the Bid Lost River and Birch Creek at the Idaho National Engineering Laboratory, Idaho”, WRI 96-4163, dated 1996

4. Ostenaa, D. A., “Phase 2 Paleohydrologic and Geomorphic Studies for the Assessment of Flood Risk for the Idaho National Engineering and Environmental Laboratory, Idaho”, Report 99-7, dated 9/16/99.

5. Letter, R. H. Guymon to K. B. Kelly, “Response to Department of Environmental Quality Request for Additional Floodplain Information for the Idaho National Engineering and Environmental Laboratory”, CCN 017515, dated 1/18/01.

6. Hydrology Subcommittee, “Guidelines for Determining Flood Flow Frequency”, Bulletin #17B, PB86-157278, dated 3/82